Health and Safety Executive

HSE information sheet

Guidance for managing shiftwork and fatigue offshore

Offshore Information Sheet No. 7/2008

Introduction

This information sheet provides advice on good practice approaches to shift working in the offshore industry. While it is intended to be used in conjunction with HSE's generic generic guidance[1,2] on shift work this document provides specific advice relating to working practices in the UK offshore sector that fall outside the scope of the generic guidance.

Background

One of the key characteristics that separate the UK offshore sector from other employment sectors is the nature of the shift working arrangements. Typically these involve an uninterrupted duty period (or tour) of 14 consecutive shifts of 12 hours each followed by 14 days of rest resulting in an equal ratio of work and rest. Tours may be worked as consecutive days, consecutive nights, or a combination of the two with a mid tour "roll-over" shift.

The 14 consecutive work periods of 12 hours is unusually long for a high hazard industry and has come about because of the limitation to the numbers of employees that can be accommodated on an offshore installation. There is also a significant overall risk reduction in having two workers offshore per post rather than the three workers that would be required if eight hour shifts were worked.

Like every other safety critical operational decision the choice of shift working patterns and tour length are under management control and subject to risk assessment and a risk based decision process. This is likely to be an analysis of alternatives against defined objectives with the chosen alternative being the option that reduces the risks so far as is reasonably practicable.

When incidents and near misses with an element of human error are investigated to root cause level, operator tiredness has often been found to have played a part[3]. However, incident reports rarely contain information on operator tiredness. The reason may well be that individuals are concerned that to do so may result in some personal blame being attributed. This can result in a falsely positive picture of the shiftwork and fatigue on an installation that can only be corrected by detailed assessment using human factors techniques, for example a human factors root cause analysis after an incident.

Although this guidance is concerned with shiftwork and fatigue these two issues are very closely related to staffing levels and workload on one hand and occupational stress on the other. Long working hours and excessive overtime are indicators that staffing levels are too low and both can be used as effective means of identifying and tracking low staffing level or down-staffing problems. Similarly long working hours and lack of sleep are widely recognised as precursors and causal factors in occupational stress and so monitoring and control of working hours and fatigue can reduce or prevent subsequent problems with work related stress.

An SMS approach to shiftwork and fatigue

Shift work schedules and working hours should be subjected to the safety management principles set out in Successful Health and Safety Management 4.

HSE's safety management model, widely adopted in the UK offshore sector, is:

1 Policy
2 Organising
3 Planning and Implementing
4 Measuring Performance
5 Auditing and Reviewing Performance

Policy

- What is the company policy regarding shift work and work schedules?
- What are the objectives of the shift system?
- Are these objectives set down for safety, alertness or performance?
- Does the shift pattern act to promote circadian rhythm adjustment to night shifts or maintain day adjustment? (see annex for further information regarding “adjustment”)
- Does the company know if the shift pattern promotes adjustment?
- Does the company understand how important operator performance is to the control of major accident hazards?

Some suggested objectives for a shift system are:

To provide the staff where and when they are required.
To minimise the physiological and psychological penalties associated with adjustment to shifts.
To promote alertness over the working period.
To minimise tiredness and fatigue.
To recognise individual variability.
To control occupational exposure.
To not increase travel hazards above those for day workers.

Organising

Guidance

- Does your organisation have documented procedures in relation to how shift-work is organised?
- Is your organisation’s guidance on fatigue or shift-work linked to other risk control measures for occupational safety and major hazards?
- Is guidance provided on your working schedules and shift work?

Such guidance would be useful for:

- the OIM;
- the Medic.
- work force; and
- design and procurement staff.

Such guidance could include advice on:

- Including fatigue and time-of-day in risk assessment and work planning.
- Monitoring of personal performance.
- Sleep/rest strategies to promote adjustment to shift work.
- Diet and caffeine use.
- Travel arrangements at start and end of the tour.

Working environment

Is the work environment designed to include factors that assist in shift adaptation? For example:

- Are there high light levels in work and recreation areas?
- Is there a total blackout of personal accommodation rooms during daylight?
- Are shift workers segregated from each other, and from recreational and process noise?
- Are cabins and work schedules designed to allow sleep to be uninterrupted by call outs, either of individuals, or those with whom they share a cabin?

Planning and implementing

- Do organisational processes for task risk assessment of work planning include human fatigue as a hazard?
- Do organisational procedures enable excessive fatigue or tiredness to be raised by workers in a timely manner?
- Are the hazards to the individual and the operation associated with increased risk of fatigue and error avoided or managed to reduce risks?
- To what extent have the major hazard consequences of human error been included in fatigue related risk assessment? Errors by tired workers have caused or contributed to many major incidents.

Known hazards of shift-working offshore include:

- Early starts before 6 am.
- Overtime beyond the 12 hour shift.
- Off duty call outs.
- Too long offshore without breaks.
- Long periods of attention.
- Failure to provide back-up for "no-shows".
- Tasks with low error tolerance combined with high consequences for that error.
- Long journey times prior to travel offshore and commencing shift on arrival at the installation.

Shift and fatigue related safety critical tasks should be identified and the risk assessed.

Fatigue hazards:

- Tasks with continuous high attention or vigilance levels such as process monitoring or watch keeping.
- Tasks with high physical demands.

Monitoring Performance

- Performance indicators should reflect aspects of the impact of shift work on health and safety, and monitoring arrangements should be in place.
- Performance indicators should reflect aspects of the impact of shift work on operational integrity and major hazards.
- Fatigue should be included in incident investigation procedures.
- Monitoring should include a process to identify individuals working excessive hours even when this is without management approval, for example through swapping shifts.

Useful measures include:

- The amount of overtime worked.
- The use of sleep medication.
- The extent that incident and accident investigations refer to fatigue.
- The extent that near miss reports refer to fatigue or tiredness.
- A record of previous fatigue or work-load related complaints.
- The willingness of the management and supervision to take action in response to fatigue related issues.

Audit and Review of Performance

- Are shiftwork, fatigue or working hours included in topics covered by periodic "safety walk-throughs"?
- Do internal audits include any shiftwork, fatigue or working hours elements?
- Are shiftwork, fatigue or working hours included in your corporate continuous improvement plan?

Action

The advice contained in this sheet should be used when evaluating shift work offshore, when planning to implement changes or investigating concerns that relate to current working practices where tiredness or fatigue could be a factor. Additional guidance on some of the key issues to consider can be found in the annex.

References

1 Managing Shiftwork HSG 256 HSE Books 2006 ISBN 0 7176 6197 0

2 Reducing Error and Influencing Behaviour HSG 48 HSE Books 1999 ISBN 0 7176 2452 8

3 HSE research based on offshore incidents, and data from aviation incidents

4 Successful Health and Safety Management HSG 65 HSE Books 1997 ISBN 0 7176 1276 7

5 Offshore Information Sheet 8/2008 Policy on working hours offshore

Further information

Any queries relating to this information sheet should be addressed to:

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This information sheet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do

Annex - Key Issues

A number of “key issues” are set out below that experience has shown to be important elements in resolving any shiftwork problems.

The problem of "circadian rhythm adjustment"

The offshore industry is the primary global sector for working extended periods of consecutive night shifts, typically 7 or 14 nights. This, and the regimented and controlled living environment on an installation, are significant features of shift work offshore. There are two fundamentally different strategies that individuals or organisations can adopt when working through the night:

Stay awake overnight. The worker is sleep deprived and uses strategies to minimise night activity (ie by using low light levels) and to maintain day synchronism of their circadian rhythms (or "body clock"). Workers often take naps during the work period and try to stay awake as much as possible the following day so that sleep is easy the following night. Performance is good on the first night but falls sharply after two or more nights. This strategy is typical of fast rotation (or "continental" shifts) where it is rare to work more than two consecutive nights and these are always followed by several rest days. The majority of shiftwork onshore is arranged this way.

Adjust one's body clock. This is effectively like flying to America. The worker experiences several days of "jet lag" (or circadian adjustment) followed by a return to normal performance over the new working period. Day sleep is full and effective and night alertness matches (or comes close to) that of day workers. A return to daytime activity requires another period of several days' adjustment to return to "normal" time. Performance is reduced for the first 3 or 4 nights during the period of circadian adjustment but returns to normal after this period. Almost all offshore shiftwork follows this pattern.

This difference is central to why any advice for shift work offshore must be specific to the working situation and why advice developed for fast rotation cannot be applied to one or two weeks of consecutive nights (or vice-a-versa).

The "roll-over" or "swing" shift

To provide 24 hour cover the 14 working days of the offshore tour can be arranged in a number of shift patterns. The most common is 7 nights followed by 7 days (7N-7D) with a roll-over or swing shift mid-tour. Shift changes are usually at 6 or 7 AM and PM. An alternative is an alternating tour pattern with 14 days on one tour and 14 nights on the next (14N/14D). This removes the roll-over and also halves the numbers of circadian adjustments over the working year.

Less common but also worked is a 7 day/7 night pattern with a roll-over shift. Many drilling rigs, particularly those managed from the US, follow a working pattern common in the Gulf of Mexico; a 12-12 day running from mid-day to mid-night for 7 "days" followed by 7 "nights" of mid-night to mid-day with a mid-tour roll-over (often referred to as the "drillers' shifts").

HSE's own research [RR002[1], RR318[2]] has compared these shift patterns for such features as worker alertness, reaction time, decision-making, and sleep duration and quality as well as acceptability and effects on family life. On all of the performance measures and long term health the alternating tour of 14 nights and 14 days (14N/14D) scores the highest by a good margin. There is little room for doubt that this is the work schedule that will deliver the best worker performance and least probability of human error. This effect is so marked that some other offshore regimes are considering mandating it.

However this 14N/14D schedule places the circadian adjustment at the end of the 14 nights tour in the employees own off-duty time. This is resented by many employees and has resulted in this schedule only receiving limited adoption in the UK sector. In at least one case a duty holder has introduced the 14N/14D schedule only to have to revert to the 7D-7N under pressure from the workforce; the workers preferred to be tired at work after the roll-over rather than at home after the tour. Conversely employees who have begun offshore work on a 14D/14N schedule complain of poor sleep and fatigue when moved to installations working the old 7N-7D pattern.

The 14 night tour alternated with the 14 day tour is the safer shift schedule and is backed up by extensive field measurements of human performance.

HSE recognises that employee objections can prevent a duty holder from adopting this schedule with the result that a potentially more hazardous schedule is worked. In these circumstances the duty holder should mitigate and control any additional risk by means of performance monitoring, lower work loads during the roll-over and, possibly, a larger crew complement to allow for additional rest periods.

Where a duty holder chooses to operate a shift pattern with a mid tour roll over they should ensure that risks to persons are controlled and reduced so far as is reasonably practicable.

Travel risks

Driving

Driving when fatigued is a widely recognised factor in road accidents. The highest risk is when travelling to work or the heliport early in the morning. This is because workers find it very difficult to sleep before a tour, particularly if they are anxious about the helicopter flight. They have to set off very early and sometimes fall back to sleep in the warm quiet environment of the car.

Some offshore workers drive long journeys from the heliport to home. It is important that rest and flight schedules enable these journeys to be undertaken safely. A night adjusted worker may be safer driving at night whereas a day adjusted one may be safer driving during the day.

The ILO (International Labour Organisation. Geneva) include commuting accidents in shift work related incident statistics but this data is not collated in the UK.

Courts now consider “driving while **knowingly** incapacitated by tiredness” as equivalent to other driving offences of incapacity, for example though drink or drugs. It is now considered very unlikely that a driver could be incapacitated by tiredness and not be aware of it. The duty rests with the driver as only they can assess their own state of alertness because this changes with time. The decision to drive on, or stop and rest can only be made by the driver. In this situation it would be good practice for employers to provide alternative transport, or rest or overnight accommodation close to the heliport once alerted to the risk by their employees.

The situation could be different for an offshore employee returning onshore from a 14 night (or day) tour but this has yet to be tested. This situation could have implications for: a) an employer who fails to provide rest or overnight facilities close to the heliport once alerted to the risk; or b) employees who fail to notify their employer of problems or fail to make use of rest, accomodation or travel facilities once provided.

Helicopter travel

During periods of poor weather or high work activity on an installation a shortage of bed space can occur. There are two principle alternative solutions: a) helicopter shuttling to the beach or a near by installation on a daily basis; or b) "hot bunking" where the day and night shift employees share bunks. In the Norwegian sector the NPD (now the Petroleum Safety Directorate) and OLF (the Norwegian Offshore Employers’ Association) undertook an extensive risk assessment of these alternatives.

The elevated risk for hot bunking includes inconvenience and reduced sleep quality. However the elevated risk for shuttling includes the summation of flight risk, reduced sleep due to the time on daily flights, additional flight anxiety and the attendant check-in and briefing periods being added to the 12 hour shift duration. When the additional work has been planned some time in advance and the accommodation problems are foreseeable then one reasonable alternative solution is the provision of a "flotel" alongside, or additional temporary accomodation of a suitable standard on the installation.

References

1 Psychosocial aspects of work and health in the north sea oil and gas industry RR002 HSE Books 2002 ISBN 0 7176 2156 1 http://www.hse.gov.uk/research/rrpdf/rr002.pdf

2 Effect of shift schedule on offshore shiftworkers' circadian rhythms and health RR318
HSE Books 2005 ISBN 0 7176 2973 2
http://www.hse.gov.uk/research/rrpdf/rr318.pdf

This information sheet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do